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toward the direction of the prevailing winds and away from the direction of their progression. The middle and most advanced part of the parabola tends to travel faster than the flanks, which are held back more effectively by the protecting growth of dune plants. In fact this center is often blown away entirely, and the flanks then remain as isolated nearly straight ridges which run approximately parallel with the direction of the prevailing winds. Such nearly straight and parallel ridges are therefore not to be regarded as independent formations, but rather as remnants of earlier loop-shaped ridges. The author also observes that the trend of the dune ridges changes in different localities with the changing proportions of the strongest prevailing winds. The direction inland, also, is a little different from the direction near the coast, but the cause for this difference is not yet very clear. It is shown that the dunes, in traveling over the land, do not always leave a deposit along their course. In several places it was noticed that the winds in the rear of the dunes have eroded the ground a few feet below the original level seen in front of the advancing sand.

J. A. U.

A Great Pre-Glacial River in Northern Canada.

At the annual meeting of the Royal Society of Canada held in Ottawa on May 15, Professor Robert Bell of the Geological Survey read a paper on the above subject, illustrated by a map which he had prepared as the result of much study and extensive observation in the northern regions. We take the following report from the *Ottawa Journal*. It was, he said, generally conceded by geologists that just before the advent of the glacial epoch, the continent of North America stood at a considerably greater elevation than at present, the difference, according to some authorities, amounting to two or three thousand feet, if not more. The difference was greater towards the south, as compared with the present general altitudes. The inevitable result of this would be to greatly alter the river systems. We should find in northern Canada a wide central drainage area equal to about one-third of the present land surface of the continent, the center of which would be in the region now covered by Hudson Bay.

This great inland sea does not average 400 feet in depth, and it would be all dry land even with a very moderate elevation.

Hudson Strait is much deeper and it would either form a long bay or a river valley, according to the amount of the continental elevation.

Some geologists think that about this time the upper part of the St. Lawrence basin, including all the lakes, excepting Ontario, discharged its waters northward from Lake Superior. But even without this doubtful part the drainage area of this one great northern river would be seven times that of the present St. Lawrence. Judging from the ancient erosion of the valleys and from other considerations, the annual precipitation was at least as great then as now, so that this former river must have been of gigantic proportions compared with any river of the present world.

Its catch-basin would extend from the sources of the Saskatchewan and the Athabasca beyond the Rocky mountains to near the eastern coast of Labrador, and from the Minnesota river in the south to the northern part of Baffin Land and would also include the southern part of the great McKenzie basin. It would flow through the center of Hudson Bay and down Hudson Strait. The former existence of this great river was not a mere speculation as to what might have been, but a necessary consequence of the elevation and change in the slope of the land, and it was proved in detail by a multitude of concordant facts all over the territory involved.

Missouri Geological Survey. Vols. IV. and V., Palæontology of Missouri, by CHARLES ROLLIN KEYES, A.M., Ph.D., State Geologist, pp. 271 and 266. Vols. VI. and VII., Lead and Zinc Deposits, by ARTHUR WINSLOW, assisted by JAMES D. ROBERTSON, pp. xxi. + 763. Jefferson City, 1894.

The issuance in rapid succession of four volumes of the reports of the Missouri Survey indicates a laudable administrative activity. They bring us a grateful relief from the solicitude that was recently felt for the future of the survey. While much of the work of which these four volumes are an expression was done under the previous administration of Mr. Winslow and is to be credited to him and his collaborators, much credit is also due to the administration of Mr. Keyes for their present creditable issuance, as well as for his own large contribution to them.

Volumes IV. and V. relate to palæontology and were prepared by Director Keyes. Volume IV. opens with an introductory chapter on the nature and importance of palæontological data. This is followed by a synoptical description of the formations of Missouri, and a chapter on the biological relations of fossils, these three chapters being pre-